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Public Health Recommendations for Smallpox Vaccine Use

Today the Advisory Committee on Immunization Practices (ACIP) issued revised recommendations regarding smallpox vaccine. ACIP consists of 15 experts in fields associated with immunization who have been selected by the Secretary of the U.S. Department of Health and Human Services to provide advice and guidance to the Secretary, the Assistant Secretary for Health, and the Centers for Disease Control and Prevention (CDC) on the most effective means to prevent vaccine-preventable diseases.

This Health Advisory is intended to provide health care providers in King County with information regarding smallpox vaccine and is adapted from the Infectious Diseases Society of America Statement on Smallpox Vaccination and information from today's ACIP meeting.

Why are new recommendations on smallpox being made at this time?

Although smallpox no longer occurs, its causative agent, variola virus, still exists. There is uncertainty as to whether or not smallpox virus has been obtained by persons who might use it to cause intentional infections. Because smallpox does not occur naturally, use of smallpox vaccine is based on the probability or risk of an intentional release of variola virus during a bioterrorism attack. **The likelihood of an intentional smallpox release is impossible to know with certainty. Experts believe the risk is very small at this time, but not zero.**

Decision-making for vaccine use in general balances the risk of disease against the side effects of the vaccine. Smallpox vaccine is associated with potentially severe adverse effects. A pre-exposure (before any smallpox cases actually occur) smallpox vaccination campaign for the U.S. general public aged 1 to 65 could result in as many as 4,600 serious adverse events and 285 deaths just among persons who are not at high-risk for vaccine complications.

In the pre-attack setting, contra-indications to smallpox vaccination include HIV infection, organ or bone marrow transplantation, therapy with immunosuppressive drugs, pregnancy, congenital immune deficiency and either history of or active eczema or exfoliative dermatitis. These conditions are likely to be present in an appreciable proportion of both the general population and health care workers. Administration of smallpox vaccine to persons at high-risk for vaccine complications would result in many more serious adverse reactions including deaths.

In the absence of natural smallpox disease, ACIP is not recommending routine vaccination of the general public or health care workers before an attack. The current low level of risk of disease does not justify the risks of such a preemptive vaccination program.

ACIP has recommended that each state develop a plan to immunize a limited number of teams and hospital staff that would be "first responders" pre-designated to investigate, care for and/or evaluate the initial cases of smallpox in the event of an attack or outbreak.

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These teams would most likely include designated persons from the following high priority groups for smallpox vaccination in the event of an outbreak:

- persons involved in direct medical or public health management or transport of suspected or confirmed smallpox cases
- lab staff processing specimens from suspected or confirmed cases
- other persons at risk of contact with infectious materials (i.e. certain hospital workers)
- persons whose unhindered function is essential to support response activities

CDC will be reviewing the ACIP recommendations over the coming months and developing policy recommendations for state and local health departments. If directed to do so by CDC, Public Health – Seattle & King County and Washington State Department of Health will work together to develop smallpox response teams and provide vaccine to designated high-risk members of such teams in accordance with CDC recommendations as they are made available.

Should smallpox actually occur in a community, vaccine would be made available to persons exposed to a release of smallpox virus and/or suspected and confirmed cases and persons in priority groups for vaccination according to the CDC's Smallpox Response Plan, including health care workers and others (see above). If multiple cases or other evidence suggesting more than limited spread of smallpox in the community are present, more widespread vaccination of the population would be carried out.

GENERAL INFORMATION ON SMALLPOX AND SMALLPOX VACCINE

What is smallpox?

- Smallpox is a severe rash illness with fever caused by variola virus.
- Smallpox vaccine is made from vaccinia, a related virus.
- After the successful global vaccination-based smallpox elimination program, the World Health Organization declared smallpox eradicated from the earth in 1980.
- Routine vaccination for smallpox in the U.S. stopped in 1972. Because protection from the vaccine decreases with time, virtually all persons in the U.S. are considered susceptible to smallpox today.
- Smallpox is of current concern because of its theoretical potential use as a biological weapon, although there is currently no way to predict the likelihood of this actually occurring.

Symptoms

- A febrile illness (prodrome) occurs 1-4 days before rash onset consisting of fever >102º F and at least one of the following: patient looks and feels severely ill, headache, backache, chills, vomiting, or severe abdominal pain.
- After 1-4 days, classic smallpox lesions appear in the mouth and throat followed by the face, hands, and forearms and spread over 7 days to the lower extremities and the trunk. Lesions progress slowly over about a week from macules to vesicles to pustules to scabs, and subsequently over another 1-2 weeks to separation of scabs. Lesions are deep, firm/hard, round, and well-circumscribed.
- Lesions are in same stage of development on any one part of the body (e.g., face or arm).

Smallpox can be differentiated from varicella (chickenpox) by differences in lesion progression and distribution, illness course and presence of a febrile prodrome.

Smallpox clinical features	Varicella clinical features
Febrile prodrome 1-4 days before rash onset	Short, mild or no prodrome
Lesions deep, firm, well-circumscribed	Lesions typically superficial, appear delicate
Rash concentrated on face & extremities, lesions on palms and soles	Rash concentrated on trunk and proximal extremities, uncommon on palms & soles
Rash in same stage of evolution on any one part of body.	Rash appears in crops, lesions in different stages of evolution.
Rash evolves slowly; papules → pustules over days	Rash evolves more quickly; some macules → crusts in one day
Extremely ill	Feel unwell, but not usually extremely ill
Illness lasts 14-21 days	Illness lasts 4-7 days

Transmission of smallpox

- Smallpox is primarily transmitted from person-to-person by respiratory droplets (like chickenpox and influenza). Less commonly, transmission occurs through infectious aerosols, followed by direct contact with smallpox lesions. Smallpox is less easily transmitted than measles, chickenpox or influenza.
- Smallpox is most contagious from the onset of rash until day 7-10 of the rash.. The ability to spread the virus decreases with scab formation and ceases with separation of scabs.
- Secondary cases occur primarily in household, hospital, and other close contacts and severely ill or coughing patients are most infectious.
- Smallpox can remain infectious for prolonged periods on contaminated clothing and bedding.
- Infection control recommendations include both droplet and aerosol precautions.

Diagnosis of smallpox

Clinical diagnosis is made by evaluation of clinical symptoms and rash using the CDC diagnostic criteria for smallpox, and is confirmed with laboratory testing at CDC.

Smallpox vaccine

- Smallpox vaccine is made from live vaccinia virus, which is similar to but different from smallpox (variola) virus.
- There are currently about 200 million doses in the U.S. vaccine stockpile and more doses are being produced which will be added to the national supply.
- Vaccine is administered by poking the skin 15 times with a bifurcated (two-pronged) needle, which causes a localized vaccinia infection.
- Six to eight days after vaccination, a scab or ulcer develops at the vaccine site. This reaction is called a "take" and means that immunity has developed.
- A permanent scar will result at the injection site. If this reaction does not occur, the vaccination should be repeated.
- Routine smallpox vaccination in the U.S. stopped in 1972. Since 1980 vaccinia vaccine has been recommended only to protect laboratory workers from infection with orthopoxviruses.
- Immunity from the vaccine wanes with time; therefore in a present-day release of variola virus, most people are considered susceptible to infection.

- **There is no recommendation to resume routine smallpox vaccination at this time.** The current CDC strategy for control of a smallpox outbreak is "ring vaccination" of contacts of cases following report of a smallpox case. This involves isolation of confirmed & suspected smallpox cases, vaccination & close surveillance of contacts, and vaccination of contacts of the contacts.

Adverse reactions
Successful vaccination, particularly in persons receiving their first dose of vaccine, is associated with tenderness, redness, swelling, and a lesion at the vaccination site, and may cause fever for a few days. The lymph nodes in the armpit of the vaccinated arm may become enlarged and tender. These symptoms are more common in persons receiving their first dose of vaccine (15%-20%) than in persons being revaccinated (5%-10%).

The overall risks of serious complications of vaccinia vaccination are low, but not insignificant. Complications occur more frequently in persons receiving their first dose of vaccine, and among young children. The rates of complications following primary vaccination listed below are taken from the June 22, 2001 issue of MMWR [50(RR10);1-25]: *Vaccinia (Smallpox) Vaccine - Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2001* and are derived from observations made when smallpox vaccine was in routine use in the U.S. over 30 years ago. Higher rates of vaccine complications would likely occur today given the increased number of persons with medical conditions or medications causing immune system compromise.

The most frequent serious complications of vaccination are:
- Encephalitis (brain inflammation) -- (12.3 per million). This complication is fatal in 25% of cases, and causes neurological sequelae in 23%.
- Vaccinia necrosum (progressive destruction of skin and other tissues at the vaccination site that spreads throughout the body) -- (1.5 per million doses). This complication has been limited to recipients who have abnormalities of their immune system, for whom pre-exposure administration of vaccine in contraindicated.
- Eczema vaccinatum (severe infection of skin caused by vaccinia virus in persons with eczema or other chronic skin disorder) -- (38.5 per million doses). This complication has been limited to recipients who have eczema or other chronic skin conditions, for whom pre-exposure administration of vaccine is contraindicated.
- Fetal vaccinia - rare

Other less serious complications include:

- Generalized vaccinia (spread of vaccinia virus to other parts of the body) -- 241.5 per million doses. Generalized vaccinia in persons without underlying illness (such as immune deficiency) is generally self-limited although approximately 10% of cases are severe.
- Inadvertent transfer (autoinoculation) of vaccinia from the vaccination site to other parts of the body causing localized vaccinia infections – 529.2 per million doses (30% in one study were contacts). Inadvertent transfer of vaccinia from the vaccination site to other parts of the body can be prevented by careful handwashing after touching the vaccination site and keeping the site covered.

Because the vaccinia virus is present at the vaccination site, other persons can become infected if they come in direct contact with the vaccinee's lesions. Vaccinees can also transfer virus from the vaccination site to another person by touching the lesion and then touching the other person. The exact risk of infection by such routes of transmission is unknown; however, virus can be cultured from the vaccination site until the skin heals. Most instances of contact transmission of vaccinia do not lead to serious illness in the contact. However, persons at high-risk of severe adverse events (persons with immune system compromise) can develop serious infection with vaccinia virus through inadvertent contact with vaccinees.

Vaccinia Immune Globulin (VIG) has been used to treat severe vaccine reactions (except encephalitis and eye involvement) in the past, however, currently supplies of VIG are limited and VIG is not likely to be available to the majority of persons who might require it during a large scale vaccination campaign.

In the absence of a smallpox attack, who should be vaccinated?

At this time, only persons working in laboratories with dangerous strains of vaccinia virus are recommended to receive smallpox vaccine. If directed to do so by CDC, Public Health and Washington State Department of Health will work together to develop smallpox response teams and provide vaccine to designated high-risk members of such teams in accordance with CDC recommendations as they are made available.

People with the following conditions are at increased risk of developing severe complications following vaccination with vaccinia vaccine and should not be immunized in the absence of a smallpox exposure or outbreak:

- Diseases or conditions which cause immunodeficiency, such as HIV, AIDS, leukemia, lymphoma, generalized malignancy, agammaglobulinemia, or chemotherapy, radiation or high doses of corticosteroids.
- History of eczema, even if the condition is mild or not presently active.
- Pregnancy or planning to become pregnant within a month after vaccination.
- Other acute or chronic skin conditions such as atopic dermatitis, burns, impetigo, or varicella zoster (shingles).
- Life-threatening allergy to polymixin B, streptomycin, tetracycline, or neomycin.

In addition, because of the risk of transferring vaccinia from vaccinees to susceptible contacts, people who have household, sexual or other close contact with a person who has one of the above conditions should not be vaccinated in the absence of a smallpox outbreak or release.

WHERE CAN I GET MORE INFORMATION ABOUT SMALLPOX AND VACCINIA (SMALLPOX) VACCINE?

If you have questions about vaccinia vaccination, you can discuss with your health care provider or call Public Health at 206-296-4774, or visit the Centers for Disease Control and Prevention website at http://www.bt.cdc.gov/Agent/Smallpox/SmallpoxGen.asp.

Additional references:

CDC Advisory Committee on Immunization Practices (ACIP). " Vaccinia (Smallpox) Vaccine -- Recommendations of the Advisory Committee on Immunization Practices (ACIP), 2001. MMWR [50(RR10);1-25]; June 22, 2001. This statement is available on-line at http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5010a1.htm

Infectious Diseases Society of America Statement on Smallpox Vaccination at: http://www.idsociety.org/PA/PS&P/bioterrorism_Policy_Statement_Smallpox_vaccine_06-14-02.htm

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Transcript of the June 20,2002 CDC telebriefing on public health recommendations for use of smallpox vaccine: http://www.cdc.gov/od/oc/media/transcripts.htm